

Metabolism

Arteriosclerosis and Diabetes—In a fascinating study Joslin¹ deals with the important problem of arteriosclerosis in the diabetic. Years ago the *Janeways* of New York wrote on this subject. The diabetic patient lives and dies in the so-called arteriosclerotic zone. To demonstrate this fact several tabulations are presented which show the average age of men and women at the onset of diabetes, and roughly this is found to be at about 50 years. In 1925, in Massachusetts, 80 per cent of the patients with diabetes were above the age of 50 at death. In the present epoch of therapy, *i. e.*, the Banting epoch, with insulin, the number of diabetics in the arteriosclerotic zone is rising so that the ten-year cases have increased. Today, consequently, the diabetic, like the thin man, runs the danger of growing old. Likewise coma has dropped to a third its former incidence as a cause of death, whereas arteriosclerosis has risen threefold in importance.

The criteria for the incidence of arteriosclerosis in diabetes are obtained chiefly through three sources, namely, from autopsies, from data on death certificates, and from the findings of clinical examination. Data from this last source are more accurate and extensive in recent years, due to the custom of more thorough study and the improved methods of examining peripheral arteries. Roentgen examination of the arteries of the extremities, the ophthalmoscopic study of the retinal vessels, and certain clinical evidence of vascular changes in the brain, heart, and kidneys, are now utilized in the medical investigation.

A discussion of certain likely factors in the etiology of arteriosclerosis as encountered in diabetes follows. This is centered around the food components used in the diabetic diet. Protein is acknowledged to favor rather than prevent the onset of arteriosclerosis. In the United States, Newberg and Marsh, and in Sweden, Petren, have advocated the low protein and high fat diet. It is agreed that excessive carbohydrate tends to obesity, otherwise starch is the ideal food to give to the arteriosclerotics and particularly those who have kidney disease. On the other hand, in the diabetic, carbohydrate produces hyperglycemia, and this in turn probably incites arteriosclerosis. Allen is quoted to the effect that arteriosclerosis is demonstrable in every case past middle life in which glycosuria has been present ten years or more. The presence of acidosis over a prolonged period is likewise adduced as a contributory factor in the production of arteriosclerosis, though positive proof of this point is lacking. In Joslin's opinion fat is the chief cause of the development of premature arteriosclerosis in the diabetic, if we except, of course, the factor of advancing age. The blood fat of the diabetic tends to be above normal and is never reported in a series of cases as below normal. The per cent of blood fat rises with the severity of the disease and varies particularly with the extent of the acidosis. Obesity and its

termination in arteriosclerosis is now well known, thanks to the emphasis that Joslin has made of this point in numerous former papers. Until comparatively recently fat was welcomed in the diabetic diet because it allowed the thin diabetic more food. Except in the milder types of the disease, fat leads to the accumulation of incompletely oxidized ketone radicals in the blood, and ultimately to death in coma. However, what we are more interested in today, is the remote action of the various food components and especially their relation to vascular changes of the sclerotic type, since this is the complication which is now destroying the diabetic. Cholesterol is an important substance always associated with blood fat and is also generally increased in the diabetic blood.

Joslin then reviews some of the recent theories of the pathogenesis of arteriosclerosis. He points out the fact that clinically arteriosclerosis in diabetes attacks the arteries of the heart and extremities in preference to the cerebral vessels. In the future we must seek evidence to determine whether in the diabetic more arteriosclerosis is present than in the normal for the age and, further, whether cholesterol is present. In other words, is a different type of arteriosclerosis present in diabetes than that commonly observed in the non-diabetic? We shall also want to know whether cholesterol deposition in the arteries can be influenced by medical and dietary means. Virchow's imbibition theory of arteriosclerosis, so named and modified recently by Aschoff,² may or may not be the correct theory of the pathogenesis, but it certainly fits in with the conditions found in diabetes.

The prevention of arteriosclerosis in the diabetic is a vitally important problem, and with our present knowledge something can be accomplished in a protective way. Fat must still be an important component of the diabetic diet, but the question arises what amount is it safe to allow in order to prevent the development of arteriosclerosis. First of all, we are quite sure that the quantity must be kept so low that body weight eventually will be kept normal or a trifle below normal. We know that fat metabolism goes on abnormally, so far as cholesterol is concerned, in both the diabetic and the obese. It stands to reason, therefore, that the closer we hold the weight to the lower limits of normal the safer it will be for the patient. Further, the diabetic most prone to develop arteriosclerosis at an unusually early age has been the severe diabetic kept alive hitherto upon a low carbohydrate and high fat diet. For the present, therefore, Joslin aims during the first few years of the diabetic regimen to raise the tolerance with the help of insulin, so that eventually the patient can take 100 grams of carbohydrate or even more with a relatively small amount of insulin. Thus insulin helps in allowing the diabetic to utilize 100 grams of carbohydrate daily and consequently the total fat of the diet can be kept relatively low. This insures a lower level of fat in the blood

1. Joslin, Elliott P.: *Arteriosclerosis and Diabetes*, *Ann. of Clinical Medicine*, Vol. v, No. 12, p. 1061, June, 1927.

2. Aschoff, Ludwig: *Lectures on Pathology*. Paul B. Hoeber, Inc., N. Y., 1924. See Chapter VI, Arteriosclerosis.

and tissues, and thus retards the development of arteriosclerosis. As yet the exclusion of foods rich in cholesterol from the diet has not been advocated, since there are so many such foods and since cholesterol is too valuable a compound of the body cells to be treated in such a cavalier fashion.

The final section of this thoughtful paper discusses the treatment of diabetes and is written in the most characteristic, epigrammatic style for which Joslin is adept. The opening sentences are so forcible and impressive that I cannot do better than to quote them verbatim. "If a diabetic has known enough to live ten years, be sure you know enough to make him live another ten years before you tamper with his diet. The arteries of the young diabetic are elastic and his diabetes is so pliable and amenable to all types of treatment that you can toss him about in your diabetic salon like a rubber doll. Not so the old diabetic. His arteries are thickened and sometimes hard, and his status must be changed as delicately as you would move a choice piece of bric-a-brac. If you wish to keep a few examples of this arteriosclerotic, diabetic bric-a-brac for your son to treat, be cautious. Be guided by my experience in the early part of this century, when with youthful enthusiasm I suddenly reduced the blood sugar of a cherished Commonwealth Avenue diabetic patient, Case No. 11, who at infrequent intervals had mild attacks of angina pectoris. In the early hours of the morning I was called to her untimely death bed. And that other diabetic in 1922, Case No. 705, should be mentioned who also was found dead a few days after I reduced his blood sugar with diet and insulin." Joslin then goes on to state that the rapid reduction of the blood sugar level in elderly diabetics may be disastrous through its effect on a diseased myocardium that is already poorly nourished by sclerotic coronary arteries. In patients with a high blood pressure and a lowering of the sugar tolerance, a hyperglycemia may exist as a compensatory process to supply the requirements of a malnourished heart. Hyperglycemia must not, therefore, be regarded from the diabetic standpoint alone, but from that of the needs of the entire body. In the elderly patient surely avoid any tendency toward hypoglycemia.

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Gastro-Intestinal Disorders

Gastro-Intestinal X-Ray—I find that in commercial x-ray laboratories and in hospital x-ray departments as well, there is a tendency for the general practitioner to refer gastro-intestinal patients with a request for "x-ray examination of the stomach only."

This failure to make complete and thorough examination of the whole tract is a serious and vital mistake. It results in loss of prestige to the physician and disappointment to the patient. The chances of error are high enough without increasing them in this manner.

The reasons for this error arise in a desire to please the patient who wishes to save expense. A

patient cannot be expected to understand the reason for "examining any other spot than where the pain is." Whether it is true or not, let us credit the doctor with understanding the reasons. It is easier to feel that he understands, but allows himself to be persuaded to do what the patient wishes because some other clinician or laboratory has done the same thing.

The stomach is the seat of pain referred from many areas in the abdomen. The vegetative nervous system is capable of referring painful sensations either up or down in the spine, and that the stomach or epigastrium is the seat of pain or distress, is no reason that the pathological etiology is located there. Gastric diseases are rare; intestinal diseases are very common, relatively speaking, and when there are gastro-intestinal symptoms we need an intelligent search for the reason, not a simple looking to the spot where the reflex has placed the pain or symptom. This is, of course, true of the entire examination, but we are now speaking of x-ray examination particularly.

The intestines are not the only organ that refer symptoms to the stomach; others are the rectum, the appendix, and the gall bladder.

X-ray apparatus has been developed to a point of great perfection and facility of operation. Our commercial concerns are out to sell this apparatus, and men have installed x-ray equipment who, after having been taught the technical side of the work, are not in any way qualified to interpret the findings. The patient cannot be expected to understand and discriminate in this matter intelligently. I hope for the day when there will be some regulation from "within the party." We need organization in general medicine similar to that in general surgery. I am sure the general practitioner, and laboratory worker as well, would do well to examine the patient completely and to the best of his ability or not at all. If the patient cannot pay, it would be economy in the long run to adjust the price to the patient, or do the work gratuitously.

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Orthopedics

Fusion Operations on the Spinal Column—The joints of the spinal column are major weight-bearing joints, and when so severely distorted by injury or disease that useful motion is no longer to be expected, should be arthrodesed by callus or by fusion operation.

It is two decades since Albee, Hibbs and others pioneered the field of operation, but only within the last ten years has spinal fusion been widely accepted. Such operations are today generally recognized as a most valuable means of promoting and hastening recovery both in tuberculosis and after severe fractures of the spine.

The insertion of a single tibial graft in a cleft in the split spinous processes (Albee's operation) has the advantage of simplicity and preserves the